

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
29 April 2004 (29.04.2004)

PCT

(10) International Publication Number
WO 2004/034892 A1

(51) International Patent Classification⁷: **A61B 1/253**

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(21) International Application Number:
PCT/SE2003/001578

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 10 October 2003 (10.10.2003)

(25) Filing Language: Swedish

(26) Publication Language: English

(30) Priority Data:
0203049-2 14 October 2002 (14.10.2002) SE
0203312-4 11 November 2002 (11.11.2002) SE

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

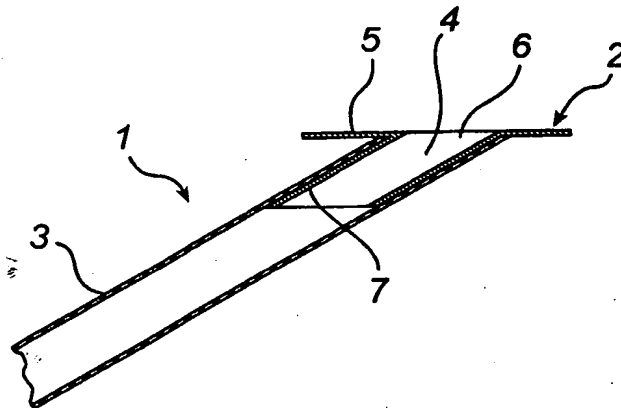
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Published:
— with international search report

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DENTIST'S MIRROR



(57) Abstract: The invention relates to a dental instrument comprising a mirror and a suction device having an inlet. Liquid from the patient's oral cavity is sucked up through said inlet by said suction device. The reflecting surface of the mirror is passed through by an opening, which during use of the instrument forms the mouth of said inlet, the reflecting surface of the mirror thus being flushed clean by the liquid flowing across it.

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JC12 Rec'd PCT/PTC 1 4 APR 2005
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DENTIST'S MIRROR

Technical Field of Invention

5 The present invention relates to a dental instrument comprising a mirror and a suction device having an inlet through which liquid is sucked by the suction device from the oral cavity of the patient.

Background of the Invention

10 For dental operations, such as fillings of cavities, and the like on the patient's teeth the dentist needs, in addition to drilling equipment and a mirror, also a suction device to suck up the flushing fluid emanating from the drilling equipment, the saliva of the patient, and tooth and filling debris, if any. The mirror is used to keep
15 the tongue and the cheeks of the patient away from the tooth being operated on while at the same time it reflects light onto the working location from an external source of light, thus allowing the dentist
20 a good view of the working area. These three devices, drill, mirror and suction device, cannot be held and manipulated simultaneously by one single person and for this reason the dentist normally needs the assistance of a dental nurse.
25 The dentist manipulates the drilling equipment as well as the mirror while simultaneously the dental nurse manipulates the suction device. The task of the dental nurse is to direct the suction device in such a manner that liquid being sucked from the
30 drilling equipment flows on top of part of the

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mirror, ensuring that the latter is kept clean during the operation. If for some reason or other no dental nurse is present, the mirror is omitted and the patient is put at an angle that enables the dentist, although with some difficulty, to view the intended working area and operate without using a mirror. However, in cases like these the dentist has to work while assuming a very uncomfortable position, and at the same time he has to interrupt the operation at regular intervals in the first place to check the working area by means of a mirror and in the second place to suck up liquid from further down the patient's pharynx. As a consequence, the operation is more time-consuming than is really necessary.

Suction devices conventionally consist of a straight tubular suction nozzle having a diameter of about 1 cm, which is connected to a pump and to an outlet for removal of the sucked-up liquid. A conventional dentist's mirror is circular and has a diameter of about 2.2 cm. The field of vision that is provided by the mirror of the mirror is, however, restricted to about 20% of the area of the mirror because of the latter being covered by saliva, flushing liquid and rests of the preparations being used in the course of the operation.

Some solutions to the problem connected with covered mirrors suggested by prior-art devices on the market involve attachment of a conventional mirror to a suction nozzle. A solution of this nature is presented e.g. in FR 2 595 939. However, in this case the suction nozzle is spaced too far

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away from the point of surgery in the oral cavity since it is obstructed by the mirror, and as a result the suction force is heavily reduced. In other prior-art devices, the suction nozzle extends in a channel formed in the mirror handle and debouches either in the rear edge or the front edge of the mirror, or at the back of the mirror. This arrangement reduces the suction capacity considerably while at the same time the channels in which the liquid is to be conveyed are narrow with consequential risks that particles from the oral cavity, such as bits of amalgam fillings or bits of other removed material, stuck in the channels.

By liquid is to be understood herein the mixture of liquid, air and debris of teeth and fillings found in the oral cavity during a dental treatment.

Summary of the Invention

The object of the invention thus is to remedy the problem outlined above. This object is achieved in accordance with invention by means of a dental instrument of the kind defined in the introduction, which has been given the characteristic features defined in claim 1. Preferred embodiments of the invention are described in the claims dependent on claim 1.

The present invention relates to a dental instrument comprising a mirror and a suction device having an inlet. Liquid originating from the patient's oral cavity is sucked up by the suction device via the inlet. The reflecting surface of the mirror is passed through by an opening, which

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during use of the instrument forms the mouth of
said inlet and the reflecting surface of the mirror
is flushed clean by the liquid flowing across it.
In an instrument thus constructed the suction
5 device and the mirror may be formed as one single
unit or as separate units that are assembled prior
to use. The mirror may for instance be formed with
a centrally located through-opening and during use
the mirror is placed on the inlet of the suction
10 device in a manner allowing flushing liquid
emanating e.g. from the drilling device to be
sucked across the mirror surface when the suction
device is in operation and liquid is present in the
oral cavity during use of the drilling equipment,
15 and to pass across the mirror surface. In this
manner, the mirror becomes self-cleaning and
condensation-free. In addition, one hand of either
the dentist or the nurse is freed because of the
reduced number of devices needed for the treatment
20 of the patient. An additional advantage found in
the arrangement of the mirror around the inlet of
the suction nozzle is that the flow of medium of
the suction device will come closer to the area
being treated than is the case in mirrors the
25 surface of extension of which is in alignment with
the direction of the suction device. Furthermore,
it becomes possible to reduce the area of the
mirror because a larger portion of its reflecting
surface is kept clean than is the case in prior-art
30 mirrors. An added advantage is that the suction
capacity of the suction device is maintained, since
the size of the inlet need not be reduced. Unlike
in prior-art devices featuring a combination of the

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-----function of the suction device and the function of the mirror, the present invention focuses on the function of the suction device while the prior-art focuses on the function of the mirror. As a result, the present invention is superior in meeting the functional demands normally put on suction devices.

Preferably, during use the mirror is prevented from rotating in the inlet of the instrument. If the mirror were to rotate, the field of vision that it provides would be lost and the operation would have to be interrupted with consequential time loss and possible injuries to the patient.

It is likewise suitable to arrange for said mirror to suck up, through said opening, all liquid intended to be removed. Preferably, the mirror forms a tight seal against the suction device to ensure that no liquid is sucked into the instrument behind the mirror. A different arrangement would considerably reduce the mirror's cleaning ability.

Furthermore, the mirror advantageously extends in the manner of a flange away from said inlet. Owing to the flange-like extension of the mirror away from the inlet and the angle of the mirror relative to the suction nozzle and the inlet therein, the reflecting area of the mirror could be given a shape and a configuration that is suitable considering the intended use and in addition the suction function could be maintained at a powerful level and be effective close to the area under treatment without interference from the mirror.

It is likewise advantageous that the mirror forms an integrated part of the instrument. In this preferred embodiment the suction nozzle and the

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-- ~~mirror therefore forms one single unit.~~ The instrument thus becomes easy to manipulate and its function is ensured, since already from the start it possesses the qualities required to provide optimum function.

5 In accordance with another suitable embodiment the mirror is removably attachable to the instrument. In this case the instrument consists of a separate suction nozzle and a separate mirror and the latter is attached to the suction-nozzle inlet prior to use. The mirror may be attached to a prior-art suction nozzle in any known manner. Suction devices already existing on the market thus may be used, making them more versatile. At the same time they benefit from the advantages provided by the invention but to a low price. A set of differently designed mirrors may be provided, thus offering the dentist the opportunity to change mirrors also during the ongoing treatment of a patient.

15 Advantagiously, the mirror of the instrument is of a magnifying kind, i.e. it preferably is concave in order to further enhance the dentist's vision.

20 In accordance with yet another advantageous embodiment the suction device comprises a tubular suction nozzle at the inlet of which said opening in the mirror forms a mouth and the suction nozzle is curved. The reason for the curvature of the tubular suction nozzle is to set the mirror at an angle and consequently to increase the dentist's vision. Parts of the suction nozzle may change it's angular direction once or several times or may have

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a gradually transitional change of it's angular direction.

It is likewise advantageous to arrange said mirror removably attachable to said suction device by means of a frictional coupling arrangement. This could be achieved for instance by providing a frictional coupling on the inner or the external face of the nozzle. This makes it an easy task to exchange the mirror and at the same time the coupling forms a tight transitional seal between the suction nozzle and the mirror.

In accordance with yet another preferred embodiment the mirror is by means of a holder removably attachable to a seat formed in said suction device. Consequently, the suction nozzle may be provided with an inlet, the edge of which forms a seat to which the mirror is intended to be fastened. In the case when the mirror is a separate part of the instrument, the same suction device may be used together with mirrors of various types or shapes, thus enhancing the usefulness of the instrument further.

Brief Description of the Drawings

The invention will be described in the following in more detail with reference to the accompanying drawings that for purely exemplifying reasons show presently particularly preferred embodiments of the present invention. In the drawings:

Fig 1 is a view from above of en instrument in accordance with the invention,

Fig 2 is a longitudinal sectional view through the instrument of Fig 1,

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Fig 3 is a longitudinal sectional view through an alternative embodiment of an instrument in accordance with the invention,

5 Fig 4 is a longitudinal sectional view through an alternative embodiment of an instrument in accordance with the invention,

Fig 5 is a longitudinal sectional view through an alternative embodiment of an instrument in accordance with the invention,

10 Fig 6 is a view from above of an alternative embodiment of an instrument in accordance with the invention, and

15 Fig 7 is a longitudinal sectional view through an alternative embodiment of an instrument in accordance with invention.

References to the components shown in the drawing figures and having identical functions have received the same numeral references.

20 Detailed Description of Preferred Embodiments

A dental instrument 1 in accordance with the present invention comprises a mirror 2 and a suction device 3. The suction device 3 has an inlet 4 through which liquid emanating from the patient's oral cavity is sucked up during active use of the instrument 1. The part of the suction device 3 that is used in the patient's cavity consists of a tubular suction nozzle, which could either be straight (see for example Fig 2) or somewhat curved (see Fig 4) for adaptation to the configuration of the area of the cavity where it is to be used. The suction nozzle of the suction device 3 has a shape in the area of its inlet 4 such that said inlet

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extends at an angle to the lengthwise extension of
 the suction nozzle. Like the curve of the suction
 nozzle also the angle could be adapted to the
 configuration of the area of the cavity where the
 instrument 1 is to be used. The reflecting face 5
 of the mirror 2 is turned away from the suction
 nozzle and from the inlet 4 of said nozzle. The
 mirror 2 extends like a flange outwardly away from
 the inlet 4 and encloses the entire inlet 4. An
 opening forming the mouth 6 of the suction device 3
 passes through the reflecting face 5 of the mirror
 5. The mirror 2 is attached tightly to the inlet 4
 preventing any liquid from being sucked into the
 instrument 1 behind the mirror. Figs 1 and 2 show
 an embodiment according to which the mirror 2 is
 connected to the inlet by means of a frictional
 coupling 7. The frictional coupling 7 extends like
 a sleeve from the mirror 2 so as to project into
 the interior of the inlet 4. In accordance with
 another embodiment illustrated in Fig 3, the mirror
 2 instead consists of a flat reflecting face 5,
 which is attached to an inlet 4, the latter being
 enlarged so as to present a seat to which the
 mirror 2 may be attached. The seat may be pressed
 outwards and be widened somewhat in its
 circumferential direction as pressure is being
 exerted thereon, in order to accommodate the mirror
 2. Once the mirror 2 is in place, the seat resumes
 its original shape and keeps the mirror 2 in place.
 In a corresponding manner, the mirror 2 may be
 released by the seat being again pressed outwards,
 allowing the mirror to be removed 2. In this

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manner, mirrors 2 of different sizes and/or shapes may be used, according to need.

When the instrument 1 is to be used, the mirror 2 is attached to the inlet 4. The instrument is then introduced into the patient's oral cavity and is directed towards the area to be treated. While the suction device 3 sucks up liquid emanating for instance from a drilling device the mirror 2 is simultaneously cleaned by the current of air that is generated by the suction device, and thus liquid is caused to flow across the surface of the mirror 2, which thus is kept clean and moisture-free.

As should be appreciated, numerous modifications of the embodiments described above are possible within the scope of protection of the invention. As already mentioned the suction nozzle in accordance with Fig 4 may have a curved configuration to facilitate operations performed in different areas of the patient's oral cavity. In addition, the instrument 1 could be made as a single unit by designing the mirror as an integral part of the suction nozzle of the suction device 3. An embodiment of this kind is shown in Fig 5 and Fig 7. Fig 7 also shows an example of a mirror 2 that may have a slightly concave shape to provide a magnifying effect. The mirror 2 may also have a rectangular shape or be formed with several facets, which may be either straight or have some other configuration. The various facets may be arranged in such a mutual relationship that together they form a funnel-like mouth in the suction device, thus further enhancing the instrument's liquid-collecting capacity. The friction coupling 7 could

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_____ consists of prongs projecting into the interior of the inlet 4 to keep the mirror in place while at the same time preventing the latter from rotating. Furthermore, Fig 6 shows an example of adaptation of the external shape of the mirror 2 to the current need. Such adaptation of shape could of course also be made in the case of integrated as well as replaceable mirrors 2. The configuration indicated in Fig 6 in broken lines is but one further example of one manner of such shape adaptation.

In addition, the components making up the device could be produced as disposable articles or as reusable articles that lend themselves to sterilisation.

Finally, it should be emphasised that according to the teachings of the invention the opening of the mirror 2 need not necessarily enclose the inlet 4 entirely. While retaining its function, the opening could extend to the edge of the reflecting surface for accommodation for instance of the suction nozzle or for adaptation to the intended use.

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CLAIMS

1. A dental instrument comprising a mirror and a suction device having an inlet, through which liquid is sucked by said suction device, characterised in that the reflecting surface of the mirror is passed through by an opening, which during use of the instrument forms the mouth of said inlet, the reflecting surface of the mirror thus being flushed clean by the liquid flowing across it.
2. A dental instrument as claimed in claim 1, wherein said mirror is prevented from rotating during use.
3. A dental instrument as claimed in any one of the preceding claims, wherein said mirror is arranged to suck up, through said opening, all liquid intended to be removed.
4. A dental instrument as claimed in any one of the preceding claims, wherein said mirror extends in the manner of a flange away from said inlet.
5. A dental instrument as claimed in any one of the preceding claims, wherein said mirror forms an integrated part of said instrument.
6. A dental instrument as claimed in any one of the preceding claims, wherein said mirror is removably attachable to said instrument.
7. A dental instrument as claimed in any one of the preceding claims, wherein said mirror is of a magnifying kind.
8. A dental instrument as claimed in any one of the preceding claims, wherein said suction device comprises a tubular suction nozzle, at the inlet of

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which said opening in the mirror forms a mouth, and wherein said suction nozzle is curved.

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9. A dental instrument as claimed in claim 4, wherein said mirror is removably attached to said suction device by means of a frictional coupling arrangement.

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10. A dental instrument as claimed in claim 4, wherein said mirror is removably attached to a seat in said suction device by means of a holder.

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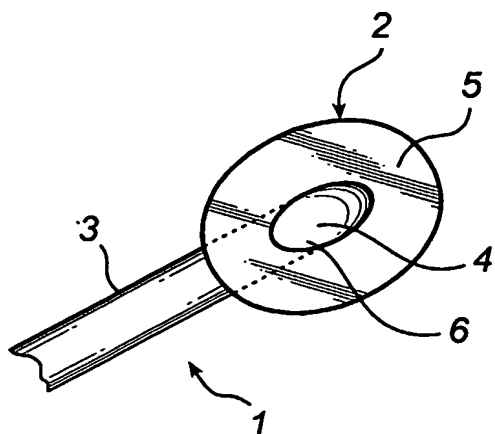


Fig. 1

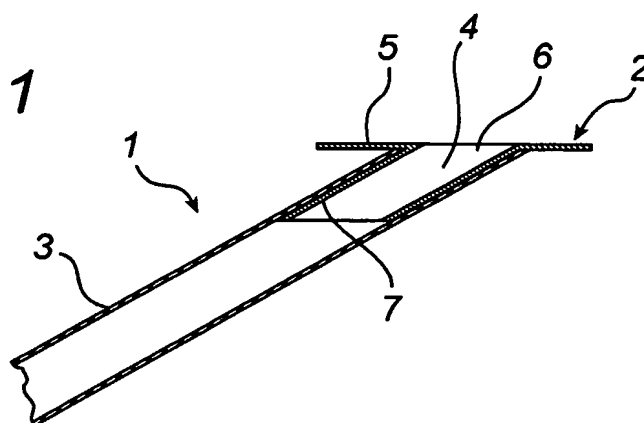


Fig. 2

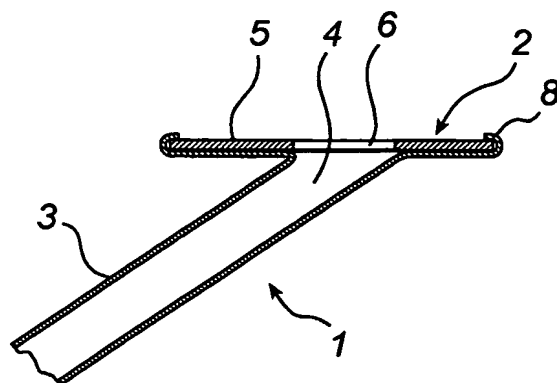


Fig. 3

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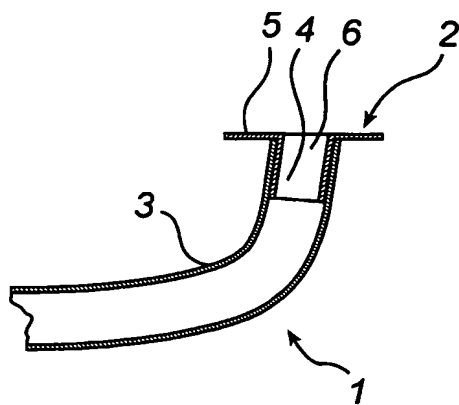


Fig. 4

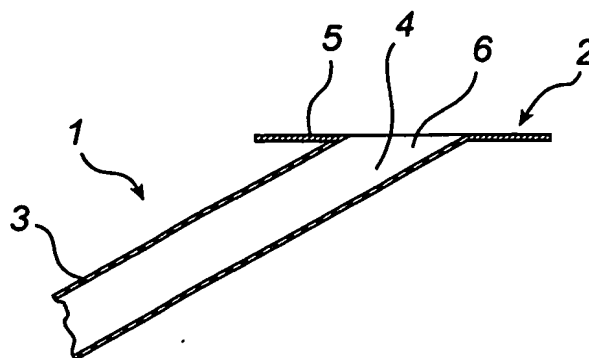


Fig. 5

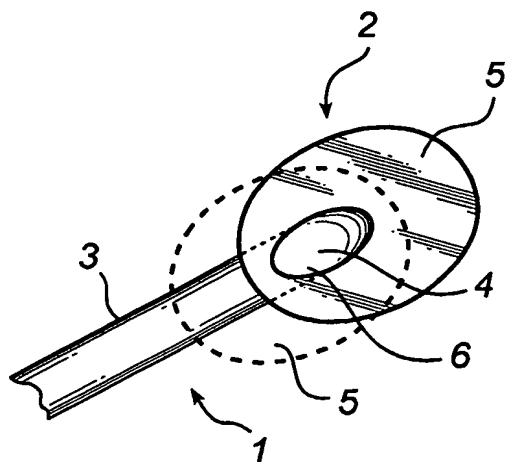


Fig. 6

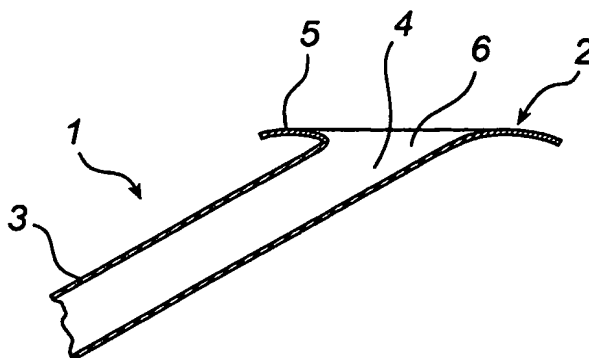


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/01578

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61B 1/253

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61B, A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2642298 A1 (BAGUR PHILIPPE ET NEBOT DANIEL), 3 August 1990 (03.08.90), figures 1-2, abstract --	1-10
Y	EP 0314657 A1 (INVO AB), 3 May 1989 (03.05.89), abstract --	1-10
Y	US 2228169 A (E. S. KEOGH, JR., ET AL), 7 January 1941 (07.01.41), column 1, line 1 - line 49, figures 1,3, abstract --	1-10
Y	US 3859987 A (HARALD HOLSTAD), 14 January 1975 (14.01.75), abstract --	1-10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

28 October 2003

Date of mailing of the international search report

03 -11- 2003

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INTERNATIONAL SEARCH REPORT

international application No.
PCT/SE 03/01578

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2393319 A (H. FREEDMAN), 22 January 1946 (22.01.46), figure 3, abstract --	1-10
A	US 5951284 A (JAMES A. LAKE), 14 Sept 1999 (14.09.99), figures 5-7, abstract -- -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

06/09/03

International application No.

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US	5951284	A	14/09/99	NONE	